

Application No. 09/719,907
Amendment dated April 17, 2003
Reply to Office Action of December 18, 2002

REMARKS

Applicants respectfully request reconsideration of the above referenced application in light of the amendments above and the remarks that follow.

Initially, the Examiner rejected claims 6-8 and 15-24 under 35 U.S.C. §112, first paragraph, as containing subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art because the specification does not describe in detail what is meant by measuring ultrasound propagation time outside the fluid vein. Applicants have canceled claims 15-24, without prejudice. Applicants respectfully traverse the rejection of claims 6-8.

Applicants respectfully submit that the specification sufficiently describes the term “fluid vein” to mean the flowing fluid in a conduit. In particular, the specification describes a “calibration step by measuring ultrasound propagation time outside the fluid vein [i.e. flowing fluid] (see specification page 5, line 9) and that the measurement corresponds “to the time taken for the ultrasound wave to pass through the various layers of the materials constituting the transducer and the region of coupling between the transducer and the fluid vein [i.e. flowing fluid]” (see specification 3, lines 81-12). As a result of this calibration step that measures the propagation time in the transducers and in the material forming the conduit and up to the point where the ultrasounds reach the flowing fluid, a method for “correcting values of ultrasound propagation time outside the fluid vein [i.e. flowing fluid], as a function of temperature,” (see specification 5, lines 14-16), is provided. Thus, Applicants respectfully submit that the plain reading of the specification teaches the term “fluid vein” to mean flowing fluid in a conduit.

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Although the plain meaning of the term “fluid vein” in light of the specification is flowing fluid, Applicants have replaced the term “fluid vein” with “flowing fluid” in claims 6-8 and 15-24 and in the specification as described above. Accordingly, Applicants respectfully request that the rejection of these claims on 35 U.S.C. §112, first paragraph be withdrawn.

Next, the Examiner rejected claims 6-8 and 15-24 under 35 U.S.C. §112, second paragraph, as being indefinite for failing to distinctly claim the invention because it is not clear what is a “fluid vein.” Applicants have canceled claims 15-24, without prejudice. Applicants respectfully traverse the rejection of claims 6-8.

As explained in response to the Examiner’s rejection of claims 6-8 and 15-24 under 35 U.S.C. §112, first paragraph, according to the plain reading of the specification, the meaning of the term “fluid vein” is flowing fluid. Accordingly, Applicants respectfully request that the rejection of these claims on 35 U.S.C. §112, second paragraph be withdrawn.

Next, the Examiner rejected claims 1, 2, 6 and 15-18 under 35 U.S.C. 103(a) as being unpatentable over Akiyama. Applicants have canceled claims 2, 15-18, without prejudice. Applicants respectfully traverse the rejection of claims 1 and 6.

The Examiner contends that Akiyama teaches a method for measuring the displacement of a fluid including the steps simultaneously exciting the two transducers and simultaneously measuring signals received at each one of the transducers. The Examiner concedes that Akiyama does not teach a step of synchronously digitizing the signals received at each one of the transducers. The Examiner contends, however, that

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Akiyama teaches a step of synchronously digitizing the signals received at each one of the transducers. Based thereon, the Examiner contends that it would have been obvious to one having ordinary skill in the art to have a step of synchronously digitizing the signals received at each one of the transducers in Akiyama for the purpose of providing a flowmeter which is of a simple circuit arrangement, which can be manufactured at low cost and which has a measuring accuracy that will be maintained for an extended period of time.

With respect to independent claim 1, Applicants respectfully submit that Akiyama does not teach the simultaneous excitation of two transducers using a single excitation circuit, as is claimed. In the Background section of Akiyama(column 2, lines 37-38 and FIG. 1), Akiyama describes the use of two separate oscillators for simultaneously exciting two separate transducers. This section of Akiyama therefore does not teach the simultaneous exciting step of claim 1 that is directed to a single excitation circuit.

Also, in the Summary section of Akiyama (column 6, lines 17-20), Akiyama teaches that:

switching element 34 is initially set, such that ultrasonic waves are radiated from ultrasonic transducer 32 to ultrasonic transducer 33 in a direction going with the flow of fluid F.

in which case the transducers are excited one after the other and not simultaneously.

Once the measurement is completed in one direction, the switching element is switched and the whole measurement process being repeated in the other direction. (See col. 8 lines

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3-10.) This section of Akiyama, that teaches non-simultaneous excitation using two circuits, also does not teach simultaneous excitation using a single exciting circuit, as is claimed.

In addition, because Akiyama teaches ultrasound emission in one direction followed by ultrasound emission in another direction, the signals are only digitized at one of the both transducers – the one currently receiving signals. Thus, Akiyama does not teach the synchronous digitizing of the signals at each one of the both transducers, as is claimed.

The disclosure of the Summary section of Akiyama (i.e., non-simultaneous excitation) also teaches against the use of simultaneous excitation (using two separate oscillators) that is disclosed in the Background section of Akiyama. Thus, Akiyama teaches away from combining the elements described in the Background section with those elements contained in the Summary section. Furthermore, no part of Akiyama teaches the simultaneous excitation of two transducers using a single excitation circuit. Accordingly, Applicants respectfully submit that claim 1 is distinguishable over Akiyama and notice to the effect that claim 1 is in condition for immediate allowance is respectfully requested.

Claim 6 depends from independent claim 1 and define further features and structure of the method. Thus, claim 6 is patentable for the reasons noted above with respect to claim 1 as well for the additional features recited therein. Accordingly, notice

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to the effect that dependent claim 6 is in condition for immediate allowance is respectfully requested.

Next, the Examiner rejected claims 3-5, 13 and 14 under 35 U.S.C. 103(a) as being unpatentable over the modified Akiyama and further in view of Kazya. Applicants have canceled claims 13 and 14, without prejudice. Applicants respectfully traverse the rejection of claims 3-5.

The Examiner contends that modified Akiyama teaches the elements of these claims except for the recitation of intercorrelating signals received, calculating the Hilbert transform of the intercorrelation and seeking zeros of the Hilbert transform. The Examiner contends, however, that Kazya discloses calculation of the difference in transit times comprising intercorrelating signals received, calculating the Hilbert transform of the intercorrelation and seeking zeros of the Hilbert transform. Based thereon, the Examiner contends that it would have been obvious to one having ordinary skill to have included in the modified Akiyama the teachings of Kazya for the purpose of providing a system for continuous measurement of ultrasonic waves in a moving medium.

Claims 3-5 depend from independent claim 1 and define further features and structure of the method. Accordingly claims 3-5 are patentable for the reasons noted above with respect to claim 1 as well for the additional features recited therein. As described above, Akiyama does not disclose the claimed step of simultaneously exciting,

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(with single excitation circuit) and measuring signals travelling in both directions between two transducers and the step of synchronously digitizing the measured signals. These steps ensure that the received signals are identical – save for the delay -- thereby increasing the accuracy of the intercorrelating step and the value of the derivate of the Hilbert transform at the point of zero-crossing. By increasing the value of the derivate, it becomes easier to accurately determine the point of zero-crossing of the Hilbert transform. As a result, the measurement of the delay also becomes more accurate. Kazya also does not teach this.

Furthermore, Applicants respectfully submit that the combination of Kazya with Akiyama is not obvious because while Akiyama is related to ultrasound flowmeters for measuring the speed of a fluid based on the comparison of the speed of ultrasounds in the moving medium, in two opposite directions, Kazya is directed to measuring the elastic properties of a moving web using an ultrasonic generator and at least two ultrasonic wave detection devices (See abstract of Kazya). Thus, it would not be obvious to one of ordinary skill to use Kazya, that relates to a moving web, for improving the apparatus of Akiyama that deals with the speed of a fluid in a conduit.

Accordingly, Applicants respectfully submit that claims 3-5 are distinguishable over the references cited by the Examiner and notice to the effect that claims 3-5 are in condition for immediate allowance is respectfully requested.

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Next, the Examiner rejected claim 7 under 35 U.S.C. 103(a) as being unpatentable over the modified Akiyama and further in view of Hill. Applicants respectfully traverse the rejection.

The Examiner contends that modified Akiyama teaches the elements of claim 7 except for the recitation of two fluids of different and known velocities. The Examiner contends, however, that Hill discloses a flow analysis system using fluids of different and known velocities. Based thereon, the Examiner contends that it would have been obvious to one having ordinary skill to have included in the modified Akiyama the teachings of Hill for the purpose of providing a non-intrusive flow analysis system and a method which provides reliable measurement of both liquid and two phase flows.

Claim 7 depends from independent claim 1 and define further features and structure of the method. Accordingly claim 7 is patentable for the reasons noted above with respect to claim 1 as well for the additional features recited therein.

Furthermore, Hill discloses measurement in a two phase flow (see col. 1 lines 15-27). In contrast, amended claimed 7 (and new claim 30) is directed to a calibration step that involves successive measurement of transit times for two fluids by measuring transit times successively for the two fluids. (See specification page 13, lines 1-12). The claimed invention, however, is directed to a single phase, not two phases, as in Hill. Accordingly, Applicants respectfully submit that claim 7 is distinguishable over the

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references cited by the Examiner and notice to the effect that claim 7 is in condition for immediate allowance is respectfully requested.

Finally, the Examiner rejected claims 8, 19-24 under 35 U.S.C. 103(a) as being unpatentable over the modified Akiyama and further in view of Conant et al. Applicants have canceled claims 19-24, without prejudice. Applicants respectfully traverse the rejection of claim 8.

The Examiner contends that modified Akiyama teaches the elements of claim 8 except for the recitation of propagation time as a function of temperature. The Examiner contends, however, that Conant discloses adjusting values of ultrasound propagation time as a function of temperature. Based thereon, the Examiner contends that it would have been obvious to one having ordinary skill to have included in the modified Akiyama the teachings of Conant for the purpose of providing a reliable ultrasound flowmeter that is not sensitive to temperature and is not susceptible to corrosion.

Claim 8 depends from independent claim 1 and define further features and structure of the method. Accordingly claim 8 is patentable for the reasons noted above with respect to claim 1 as well for the additional features recited therein.

Furthermore, Conant discloses a flowmeter to be used in the field of marine speedometers in which corrosion (that is usually associated with marine water) is an issue. In contrast, the claimed invention is directed to measuring displacement of a fluid in a conduit (see claim 1 or claim 25). Thus, it would not be obvious to one of ordinary

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skill to use Conant, that relates to marine speedometers, for improving the apparatus of Akiyama that deals with the speed of a fluid in a conduit.

Accordingly, Applicants respectfully submit that claim 8 is distinguishable over the references cited by the Examiner and notice to the effect that claim 8 is in condition for immediate allowance is respectfully requested.

Applicants submit that these amendments do not constitute new matter and have full support in the specification as filed.

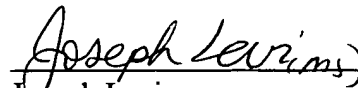
Applicant has made a diligent effort to place this application in condition for immediate allowance and notice to this effect is earnestly solicited. The Examiner is respectfully requested to reconsider the application at an early date with a view towards issuing a favorable action thereon. If upon the review of the application, the Examiner is unable to issue an immediate notice of allowance, he is respectfully requested to telephone the undersigned attorney at the number listed below with a view towards resolving the outstanding issues.

Early and favorable action is respectfully requested.

Respectfully submitted,

Date: _____

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